THE NATIONAL OBSERVATORY.

The following paper was read by Lieut. M. F. Maury before the Virginia Historical Society at its last annual meeting. As an account of the operations of the National Observatory it possesses high interest, while it has some passages of great rhetorical beauty, which were received by the audience with unbounded manifestations of delight. We copy it from the Historical Register, the organ of the Virginia Historical Society.

[*Ed. Mess.*

There are a few facts relating to the early history of the Observatory which I should be glad to have placed among the records of this Society.

They are like the under currents of the ocean, which seldom rise to the surface and which generally escape the observation of the world, though they bear a most important part in the benificent system of aqueous circulation which tempers the frigid and cools the torrid zones of the earth.

These under-tows, whether in the physical or the moral world, are felt perhaps, with their true force, only by those whose course in life is affected by them.

Many of the little events that are passing round us in silence, are to constitute the fillings-up of history. They are the under-currents, the eddies, and the drifts in the tide of Times, by the effects of which the main current is made to pass along down to posterity with the proper force, clearness and beauty.

On taking charge of the National Observatory, my first duty, after getting the instruments in proper position and adjustment, was to train a corps of observers. As soon as this was done, I began to cast about for that plan of operations, which should be the most useful to the world and creditable to the country.

The Sun and Moon, the planets, and certain fixed stars of the larger magnitudes, called fundamental stars, have been the subjects of observation ever since practical Astronomy assumed the character of an exact science. It is nevertheless necessary to continue observations upon them, in order to obtain the requisite data for the American Nautical Almanac: But the time required for this would afford full employment neither to the instruments nor the observers. What then should be done with the spare time? Should it be left unoccupied: or should we follow the example of most of the Government Observatories in Europe, and fill it up with observations on the stars at random having neither definite object, aim or system in view? The genius of our Institutions and the habit of thought among the American people forbade this. For to the honor of the one and the glory of the other, be it said, they are eminently utilitarian and practical in their exactions.

When the American people in their national character understand any thing, they never do it by halves. Their National Observatory is furnished with a most splendid set of instruments. There is but one observatory in the world superior to it in this respect. And when I was ordered to the charge of it, I felt that a heavy responsibility had been imposed upon me. It is a post that I never sought, but being assigned to it in the line of duty, I could not as an officer decline with propriety. I knew that the public expected it so to be conducted as to afford results the most useful to the world and creditable to the country. Therefore, besides the observations already alluded to, I resolved to give effect to a favorite idea, and to commence a catalogue of the stars upon a plan which, when complete, would afford a work which I thought would not be altogether unworthy of the Nation.

With splendid instruments, and industrious observers; with beautiful skies, and more of the heavens above us than they in Europe have, arrangements were commenced for a catalogue of the starry host upon a larger scale, and a more comprehensive plan than had ever before been attempted by any single astronomer. The want of such a work as a book of reference for Astronomers, has been felt for ages.

I do not mean to intimate that there are no catalogues of stars; but I mean to say there is no catalogue of *the* stars that are visible at any one place. Nor is there any one catalogue, which, besides magnitude, R. A. and Declination, gives also color, angle of position and distance, with maps of the binary systems, and clusters of the stars with drawings of the Nebulæ. There are catalogues, too numerous to mention; but the most extensive are Lalande's, Struve's and Bessel's.

Lalande's was commenced in 1789 and ended in 1801: It extends from the North Pole to the Tropic of Capricorn, and contains about 50,000 stars, but it gives position and size only down to the ninth magnitude. Bessel commenced in 1821 and finished in 1833. He worked from 45° N. to 15° S. Declination, and obtained a list of about 75,000 stars to which he assigned position and magnitude only.

Struve's is the most extensive catalogue, by far, of the double stars. It gives magnitude, color, angle of position and distance; but it does not pretend to be a complete catalogne even of all the double stars that are visible in Russia; and yet it is considered as one of the most valuable contributions of the age to Astronomy.

The plan finally adopted for the Washington

Catalogue, was to penetrate regularly and systematically with some one of our powerful telescopes, every point of space in the visible heavens, for the purpose not only of determining accurately the position of every star, cluster, and nebula, that the instruments can reach, but for the purpose also of recording magnitude and color, with angle of position and distance of binary stars, and of making drawings and giving descriptions of all clusters and nebulæ. And for this, arrangements were commenced in 1845.

Now it may be asked, why make this work so extensive? Why comprehend in it objects that never have been, and never can be seen by the naked eye?

The answer is ready with reasons abundant. The heavens like the earth, are obedient to the great law of change. The stars are undergoing perpetual change, some change their position, some vary in magnitude, some in color, and some have blazed forth like flaming meteors in the sky, dazzled the world, and then disappeared forever.

The appearance of a new star in the firmament induced Hipparchus before the Christian era to undertake the first catalogue, which although lost to the world was productive of great practical good. Ptolemy is said to have borrowed over freely from it.

In November, 1572, a star appeared all at once in great splendor. It surpassed Sirius in brilliancy, and was brighter than Jupiter in perigee. It could be seen in the day time, with the naked eye, and after two years it passed away and disappeared. Its place in the sky is now vacant. It induced Tycho Brahe to undertake his catalogue.

It may be that there is now, at this very time in the firmament above, a world on fire. „Argus, a well-known star in the Southern hemisphere, has suddenly blazed forth, and from a star of the 2nd or 3rd magnitude, now glares with the brilliancy of the first.

It is man's boast that he was made to look aloft; for his alone is the privilege to pry into "Nature's infinite book of secresy," and can it be therefore profitless to him and of no value to posterity to survhy the skies, map the stars and contemplate "the eternal flowers of heaven?"

The generation that succeeds is always wiser that that which precedes; for this begins with knowledge, advancement, and discovery where that left off. Our ancestors gathered facts, and recorded observations, which in our hands have become clues guiding to knowledge, or leading to discovery. Shall we do less? He who has the privilege of interrogating nature in the name of society, and yet fails to preserve her answers, is regarded by the scientific world as one who betrays his trust, and thereby wrongs the living and defrauds posterity.

In 1795, Lalande saw a star, and entered it upon his catalogue. In 1847 it was discovered at the Washington Observatory that that star was the planet Neptune. Thus, by the fidelity of that observer, and the means of his catalogue, we are enabled to know at once what otherwise we should have had to wait fifty years to learn. But for that observation of Lalande, astronomers would have had to watt half a century for data to enable them to determine the orbit of that planet as accurately as Mr. Walker, formerly an assistant at the National Observatory, has done in consequence of the discovery there.

Perhaps the most exquisitely beautiful objects in the heavens, are the double stars, with their contrast of colors. When the telescope is turned upon these objects, the most richly-colored orange star may be seen dancing along with its companion of bright green, or smalt blue. They are arranged in pairs or groups, with their components diversified with almost all the colors of the rainbow.

It was a long time a question whether these stars were really double, or only optically so. It was thought they appeared double, only because they happened to be situated nearly in the same direction; that one was placed at an infinite distance beyond the other. It was said, therefore, that they appeared optically near each other only, like lamps afar off in a dark night, which, though at a great distance apart, appear close together to one who sees them nearly in the same straight line.

These stars are so remote from us, that a snail might travel at his usual gait many times around the earth, before that type of velocity with us, a cannon ball, could reach the nearest of them. How then could it be ascertained whether they were physically double, or only optically so?

Catalogues and the resources of science have enabled astronomers to settle the question.

If while looking at the leaves on the trees of a forest, I hold up a dime at a certain distance before me, I will see that it hides certain leaves. If now I hold a dollar at the same place, I will find that the additional leaves hid by it, will exceed, many times in number the first, because the leaves are situated one beyond the other. They are optically close together; and the additional space optically hid by the dollar is much larger than that hid only by the dime.

Now apply this test to the double stars. Take the space in the heavens about each star, that would be hid by a pin's head when held at a convenient distance for vision, and count the stars that would be included within the space so hid. Now hold a half dime at the same distance

from the eye, and count the *additional* stars hid by it.

The first will be found to exceed the last in numbers many times. Thus the probability was established that these stars were in physical and not in mere optical connection. The Telescope was now brought to bear. Observations were made and recorded in Catalogues, and, after a lapse of years, it was discovered that many of these stars were suns actually revolving about each other.

Thus systems in which there are many suns and the most complicated motions have been detected. In some, one sun revolves about another. In others, one pair of suns is seen revolving about each other, and they two around another pair. Some have suns of sapphire blue, emerald green, orange yellow, or flaming red. And there, instead of having the alternations of light and darkness as we have here, it may be supposed that their days and nights alternate with blue, green, red or yellow light, according to the color of the sun which may be in the ascendant.

There may be some ready to say,—though I am sure there are none such here,—of what good is it to us to know that there be suns among the stars, and days of different hues, in the remote regions of space! I hold myself to be a *utilitarian* of the strictest sect. But I regard every fact that man can gather from the physical world to be of value. In the book of nature we see God's own hand-writing; and there is not to be found throughout his handy work, a single fact, word or syllable which does not relate to the destiny of man. We may not understand its bearings or comprehend its import, but it is not because it is without meaning,—it is because we are not wise enough to read the interpretation thereof. We have received more than any generation ever received of its ancestors, for the generation that preceded us had its own treasures of knowledge added to all that it received from the world before, to hand down to us. As we have received more, we are required to give more. Therefore, let us interrogate nature diligently for her laws, and for facts which are the expounders of her laws, feeling assured that the course of Man is upward and onward, and that if we ourselves can make nothing of her answers, there may be DANIELS coming after us, who will have the wisdom to read them aright, be they in characters never so strange and incomprehensible to us.

It is a part of the plan of the American Catalogue accurately to determine distance and angle of position of the double stars,—to record magnitude, color, right ascension and declination, and so enable those who come after us hundreds or thousands of years hence to compare their observations with ours and to determine therefrom the orbits and Anni Magni of these wonderful suns and curious systems. The oldest of the observations of this kind that have been handed to us, are too recent, in comparison with the myriads of our years which some of these suns require to complete a single revolution, to enable us to determine any thing as to their periods.

Perhaps of all the objects in the sky, the Nebulae are the most wonderful and mysterious. We may trace them up through the telescope from shapes the most fantastical to forms the most symmetrical and graceful. They are beyond the reach of the unaided eye. But with the telescope turned in a certain direction, we may see a mere sploch of curious light, presenting a Nebula without form, and apparently void;—with the telescope in another direction, we will see them beginning to assume regularity of outline, with marks of aggregation and condensation, as though they were in process of formation, and these several shapes were merely the nebulous stuff in different stages of growth. Some have the graceful convolutions of the smoke curl,—some are spiral,—some are rent in pieces as though they were curdling into more dense aggregations of matter; these leave black rents in the sky, through which stars are often seen to peep out from the darkness apparently at an immense distance beyond. Following them on, we trace them up into the circular form, with marks of condensation about the centre; then comes the globular appearance, with a decided nucleus; and finally, we come across the perfectly formed star, surrounded with a thin haze of nebulous matter, as though it had not yet all been quite condensed into the shining substance of the star.

The oldest observation upon these wonderful objects is of too recent a date to tell us anything as to their changes and growth, if growth they have.

The Catalogue contemplates accurate drawings of the Nebulae and the leaving by this means to posterity, the clue to that knowledge, with regard to this class of objects, which we ourselves would be so glad to have.

Under the space-penetrating powers of the telescope many of these objects are resolved into stars. Among the clusters are to be seen at one view and in a single spot not larger than Ahab's Cloud, aggregations of stars, far exceeding in number all that the unaided eye of man ever beheld in the azure vault above.

God "by his spirit hath garnished the heavens." But it is not until one of these gorgeous clusters is seen through the telescope, that one

can feel in its full force the prophet's saying—"The host of Heaven cannot be numbered."

"Canst thou bind the sweet influences of the Pleiades?"

It may be that catalogues and the telescope have enabled us to see, though darkly, the scope of the Almighty question.

By means of catalogues it has been discovered that the stars in a certain quarter of the heavens are getting optically closer and closer together, while those in an opposite quarter, are apparently separating from each other and getting wider apart, precisely in the same way as though we were receding from the one set and approaching the other.

This, therefore, suggested the idea, that our system itself might be moving in obedience to the influences of some vast center of revolution in the remote regions of space. And it has recently been shown, with such *verisimilitude* as to throw the onus of proof upon those who deny the conclusion:—that the sun with its splendid retinue of planets, satellites and comets is in motion about a center inconceivably remote; that though we are moving about it at a rate of many millions of miles in a year, the period is so immense, the distance from the center to the circumference of the orbit so great, as to require myriads and myriads of ages to complete a revolution. *And that center is in the direction of the star Alcyon*, ONE OF THE PLEIADES. Who, therefore, can "bind those sweet influences," which guide the sun and moon and earth through the trackless regions of space, and hold them so they fall not?

To me the simple passage through the Transit instrument of a star across the meridian is the height of astronomical sublimity.

At the dead hour of the night, when the world is hushed in sleep and all is still; when there is not a sound to be heard save the dead beat escapement of the clock, counting with hollow voice the footsteps of time in his ceaseless round, I turn to the Ephemeris and find there, by calculation made years ago, that when that clock tells a certain hour, a star which I never saw will be in the field of the telescope for a moment, flit through and then disappear. The instrument is set;—the moment approaches and is intently awaited;—I look;—the star mute with eloquence that gathers sublimity from the silence of the night, comes smiling and dancing into the field, and at the instant predicted even to the fraction of a second, it makes its transit and is gone! With emotions too deep for the organs of speech, the heart swells out with unutterable anthems; we then see that there *is* harmony in the heavens above; and though we cannot hear, we feel the "music of the spheres."

The time is recorded and the declination being determined, the star is entered in the Catalogue, there to stand as a record forever of its magnitude and position for that day and hour. Thus for every star, a point will be given from which in time to come Astronomers may reckon its motions.

When the sky is clear, there is every night, and all night long, an eye at every telescope in the Observatory, working for this Catalogue; and that no star shall escape us, the part of the heavens that is gone over to-night, is reëxplored to-morrow night by fresh observers with different instruments. Thus every star is to be seen at least twice, by two observers, and on two occasions; so that in time to come, it may be said by astronomers, such a star was in the heavens at the date of the Washington Catalogue, because it is in that work; but it has since disappeared, because it is not now in the heavens; or, such a star which is now visible was not so at the date of the Washington Catalogue, because it is not in that work.

Already, as the result of the first year's work, about 15,000 stars have been observed for the Catalogue; most of which are new.

Should this work be carried on and completed according to the original plan, the time may come when facts connected with the history of it will not be altogether without interest.

Here is an official order in relation to it.

"*Navy Department, March 6th*, 1846.

SIR,—Desirous that the numerous and able corps employed at the National Observatory, at Washington, may produce results important to maratime science, and to the Navy, I approve your course in making the series of Astronomical Observations, more immediately necessary for the preparation of a Nautical Almanac.

The country expects, also, that the Observatory will make adequate contributions to Astronomical science. The most celebrated European Catalogues of the Stars, 'Bessel's Zone Observations' and 'Struve's Dorpat Catalogue' of double stars, having extended to only fifteen degrees South of the Equator, and the Washington Observatory, by its geographical position, commanding a zone of fifteen degrees further South; and being provided with all instruments requisite for extending these catalogues, you are hereby authorized and directed to enter upon the observation of the heavens commencing at the lowest parallel of South Declination, which you may find practicable. You will embrace in your Catalogue all stars even of the smallest magnitude which your instruments can accurately observe. You will, when convenient, make duplicate observations of stars for each Catalogue; and, when time permits, you will determine with precision, by the Meridian instruments, the position of the principal stars in each pair or multiple of stars.

Simultaneously with these observations, you will, as far as practicable, determine the positions of such stars as have different declinations or right ascensions assigned to them in the most accredited Ephemerides.

You will, from time to time, report directly to this Department the progress of the work.

Respectfully, yours,

(Signed) GEORGE BANCROFT.

LIEUT. M. F. MAURY, Superintendent
Of the Observatory, Washington."

"The foregoing is a true copy of a letter printed in the Appendix to the 'Washington Astronomical Observations.'

J. S. KENNARD,
Passed Mid'n U. S. Navy."

This order is the surface current, and without looking deeper, it may hereafter be construed into the original first idea. Its date is "March 6;" but here is the little under-current which took its rise two months before, and makes the upper one clear.

"ORDER

OBSERVATIONS FOR 1846.

A regular series to be kept up on Polaris, αLyrae, and 61 Cygni, and on the Sun, Moon and Planets; and by the West Transit on the Moon culminators of the Nautical Almanac.

At least ten observations with each of the Meridional instruments are to be made on every Nautical Almanac Star visible during the year.

The list of clock stars to be revised. The Prime Vertical will continue its observations upon αLyrae daily; and upon 61 Cygni, and mLacertae, as soon as the last two shall be in position. It will also observe upon as many stars of the first or second magnitude as practicable, and will catalogue between the Zenith and 30° N. Declination.

The Meridian and Mural Circles will Catalogue in alternate belts of 5° Declination, the former commencing with 45° South, and extending to 35° South; one observation upon each star, cluster and nebula will suffice for the Catalogue in this part of the heavens.

The West Transit will sweep in belts adjoining the Mural.

Each instrument will number its own stars, beginning with No. 1, and will also quote magnitudes of the stars (standards for which have been given) and assign weight to every observation.

(Signed) M. F. MAURY.

January 5th, 1846."

"The above is a true copy of an order printed in the Appendix to the 'Washington Astronomical Observations.'

J. S. KENNARD,
Passed Mid'n U. S. Navy."

I have therefore chosen, gentlemen, to take this memorial from its humble place in the Observatory, to bring it with me, and ask to have it placed on record here with the Historical Society of my native State. It may be useless—we cannot tell. It is our duty to keep the stream of history as it passes by us, pure and clear; and then, we can safely leave the rest to time.

LETTERS FROM NEW-YORK.

NEW-YORK, *April* 1849.

"Cooper's new novel"—a phrase once of far more pleasing import than at present—has just appeared. Its title, "The Sea-Lions or the Lost Sealers," promises much more than it performs. I cannot say that I have read it; I endeavored honestly to do so, and failed. It is very dull, and bears no more comparison to "The Pilot," "The Red Rover," or even "The Two Admirals," than does the drone of a bagpipe to the merriest horn in Gung'l's band. Mr. Cooper grows garrulous in his old age. He was never remarkable for good temper, and seems to have lost the little that he once possessed. In these two ill-printed, dingy little volumes, there is hardly

> —— "A dash of purity and brightness
> To show the man of sense and of politeness"—

but such and so frequent are the carping and scolding—irrelevant strangely to the subject-matter—that one associates the author with his idea of Tam O' Shanter's spouse, when she sate in the chimney-corner,

> "Gathering her brows like gathering storm,
> Nursing her wrath to keep it warm."

Ever since Mr. Cooper's return to his own country from a somewhat "lengthy" expatriation, he has looked upon himself as a victim to "the ingratitude of Republics." He has, accordingly, omitted no opportunity to expatiate on our faults and foibles. In "Home as Found" his anger triumphed over his judgment, so that he condescended to reflect, with undue severity, even on the conduct and manners of his fair compatriots. I have sometimes wondered what Mr. Cooper expected on his return home. Did he presume that he should be hailed with universal acclamations? Did he look for an ovation? Were victorious wreaths to crown his brow, and arches of triumph to be thrown over his pathway? Were people to be astonished out of their usual equanimity? Was he to be regarded as a prodigy? Surely, if he expected aught beyond the deference and attention commonly paid to men of talent, he was grievously disappointed. "Progress" had been doing great things during his absence abroad. The mind of the country had grown upward,